

Title: On the Tracks to Fractionville!

Brief Overview:

This learning unit involves dividing the “whole” into fractional parts and dividing a set of a “whole” into fractional parts. The students will be participating in a train designing contest. They also will be engaged in applying previously learned concepts in computations, money, gathering, and organizing data.

Links to Standards:

- **Mathematics as Problem Solving**

Students will demonstrate their ability to solve problems in mathematics including problems with open-ended answers, problems which are solved in a cooperative atmosphere, and problems which are solved with the use of technology.

- **Mathematics as Communication**

Students will demonstrate their ability to communicate mathematically. They will read, write, and discuss mathematics with language and the signs, symbols, and terms of the discipline.

- **Mathematics as Reasoning**

Students will demonstrate their ability to reason mathematically. They will make conjectures, gather evidence, and build arguments.

- **Mathematical Connections**

Students will demonstrate their ability to connect mathematics topics within the discipline and with other disciplines.

- **Estimation & Computation**

Students will demonstrate their ability to apply estimation strategies in computation, with the use of technology, in measurement, and in problem solving. They will determine reasonableness of solutions.

- **Number Sense & Operations**

Students will demonstrate their ability to describe and apply number relationships using concrete and abstract materials. They will choose appropriate operations and describe effects of operations on numbers.

- **Statistics**

Students will demonstrate their ability to collect, organize, and display data and will interpret information obtained from displays. They will write reports based on statistical information.

- **Fractions & Decimals**

Students will demonstrate and apply concepts of fractions, mixed numbers, and decimals; use models to relate fractions to decimals and to find equivalent fractions; compute with whole numbers, fractions, and decimals; and apply fractions and decimals to problem situations.

Grade/Level:

Grades 3-4

Duration:

5 days or 5 one hour class periods

Prerequisite Knowledge:

Students should have working knowledge of the following skills:

- Recognizing and constructing fractions that are parts to a whole and parts of a set
- Basic problem solving and computational skills
- Reading and constructing charts and tables.
- Calculator skills
- Computing money

Objectives:

Students will be able to:

- work in cooperative groups and independently.
- design a train according to specific criteria.
- participate in hands-on activities.
- identify fractional parts of wholes and sets.
- construct and decode a fractional secret code.
- interpret charts and complete work table.
- use strategies to keep within a set budget.
- describe and interpret information from a data display.

Materials/Resources/Printed Materials:**All Days:**

- Student Work Booklet - Resource pages copied and attached together in a booklet form

Day 1:

- Blank spinner - one per group of four - Teacher Resource Sheet 1
- One paper clip per spinner

Day 2:

- Sentence Strips - three per group
- Train patterns - Teacher Resource Sheet 2
- Scissors

Day 3:

- Calculators

Day 4:

- Calculators
- Markers or crayons
- Star stickers or students may draw the stars
- Glitter or students may make small dots with crayons or markers

- Sequins or students may make large dots with crayons or markers
- Glue

Development/Procedures:

Day 1:

Teacher present the following scenario to the students:

Mattel is having a contest to come up with a new toy train for the TransAmerican Train Festival. They are asking all the schools in our area to submit plans for the train. The winning group gets to name the train and join them at the festival to be introduced as the designers. There are specific criteria that must be followed in order to have the train entered into the festival. However, Mattel wants to keep the cost of the train below \$50.00, so they will be able to sell it for a reasonable cost to it customers after the festival.

Warm-up:

Working in groups of four students will be given one spinner with fractions written on it in each section of the spinner. (Include fractions that are grade-level appropriate) The students will use a paper clip to spin the spinner. They will record in their journals the fraction that appears on the spinner and then draw a picture that represents that fraction. The members of the group must check each others drawings then the spinner should be passed on to the next person until time runs out. This activity should take about 5 to 7 minutes.

Teacher says to class: The festival officials have sent to us the information we need to create our trains. Unfortunately, part of the flyer is written in code and in order to read the message it must be decoded.

Teacher will then do an example with the class to solve the word fractions.

Do not put the answers to the clues on the board, but you may want to do the first one together.

Write on the board the following clues:

- | | |
|--|------------|
| 1. Last $\frac{1}{5}$ of fluff | <u>F</u> |
| 2. First $\frac{1}{6}$ of rascal | <u>r</u> |
| 3. First $\frac{3}{8}$ of activity | <u>act</u> |
| 4. Last $\frac{3}{14}$ of multiplication | <u>ion</u> |
| 5. First $\frac{1}{3}$ of sun | <u>s</u> |

Pass out the students' booklets and turn to Student Resource Sheet 1.2. Have the students work **independently** to solve the code. When the class has finished solving the code, go over the answer together. Next, teacher will orally tell the students to create their own fraction code on the back of the Student Resource Sheet 1.2. It could be about their favorite food, movie, color, book, or etc. The students can then exchange their papers to solve each others codes or a few could be done as a class. Collect booklets. As homework the students could make up a sentence about themselves in the fraction code.

Day 2:

Warm-up:

Human Fractions - The teacher will call up about five students to the front of the room making sure that about two boys and three girls have been picked. The object of the game is for the students to guess a specific criteria that fits the fraction the teacher gives the class. For example, $\frac{2}{5}$ of the whole in the above group of students is _____. Then the student will try to fill in the blank using the group in the front of the room. This answer would be two boys, but the students may see a small detail such as, two students could be wearing glasses and this would be fine as long as it fits the given fraction. The teacher may want to start off using obvious examples and move towards more detailed ones or increase the number of students in the group as the class gets better with the game. Time limit about 5 to 10 minutes.

Teacher will have the Student Booklets passed out and the scenario will be reread with the class following along from Student Resource Sheet 1.1. The teacher will tell the students that today they will be designing their trains in groups of four. They will be given only 45 minutes to complete this activity according to the Student Resource Sheet 2.1. You may want to remind the class when there is only 10 to 5 minutes left. Have the supplies passed out and have the students begin designing their trains. When class is finished collect the booklets and paper trains.

Day 3:

The teacher will tell the class that they will be figuring out the total cost of their train, including purchasing the cars and decorating them. They will have to stay within a budget of \$50.00 for the total cost of their trains. The Student Booklets, paper trains, and calculators are passed out. Independently the students will complete Resource sheets 3.1 and 3.2 then they will stop and wait for further directions. The time limit should be set at about 20 to 30 minutes depending on the students. After the time has expired the students will work in their groups on Resource Sheet 3.3. The time limit for this task should be about 20 to 25 minutes. When the class is finished collect the booklets and paper trains.

Day 4:

The teacher will tell the class that they will be decorating their trains according to the budget they set up yesterday. They will not be able to make any changes to their budget sheet at this time. The students will then bring their budget sheets up to the teacher so that she may distribute the supplies. If you are not going to use the supplies listed because the students are going to be drawing the decorations themselves then the teacher may want to check the budget sheet before they begin. The class will then decorate their trains for approximately 25 minutes. They will independently complete Resource Sheet 4.1 which is to describe their trains using fractional language.

Day 5:

The teacher will tell the class that today they will be write a letter to accompany their trains for the judging by Mattel. The class will be writing a letter trying to persuade Mattel to pick their train over the rest of the class. This activity is to be done independently. The teacher could use the writing process with this activity if the time was available or she could have the student complete the letter in one class setting. The Student Booklets and paper trains should be passed out.

Performance Assessment:

Day 1:

The Student Resource Sheet 1.2 has only one answer which is Freedom Train. The students' codes are to be checked by classmates.

Day 2:

The Student Resource Sheets 2.1 and 2.2 are the train criteria which will be assessed as group grades. See Teacher Resource Sheet 3 for the answers.

Day 3:

The Student Resource Sheets 3.1 and 3.2 are independently graded and the answers are on Teacher Resource Sheet 4 and 5. The Student Resource Sheet 3.3 will be scored using a scoring key which is also on Teacher Resource Sheet 6.

Day 4:

The Student Resource Sheet 4.1 is an independent activity which will be scored using a scoring key. This is on Teacher Resource Sheet 7.

Day 5:

The Student Resource Sheet 5.2 is a persuasive letter to Mattel. This will be assessed using Rubric which is on Teacher Resource Sheet 8.

Extension/Follow Up:

The teacher can get some picture books about trains to share with the class or assign them one to read. She could also check-out records that have songs about trains on them so they could listen to them while they design or decorate the trains. They could learn some songs about trains such as, "I've Been Working On The Railroad", "Locomotion", and modify "The Wheels On The Bus" to "The Wheels On The Train."

Research trains to find out what are the different types of trains, why there are different kinds, what are the different types of cars on the train and what is their function.

Take a field trip to a train station and take ride on the train.

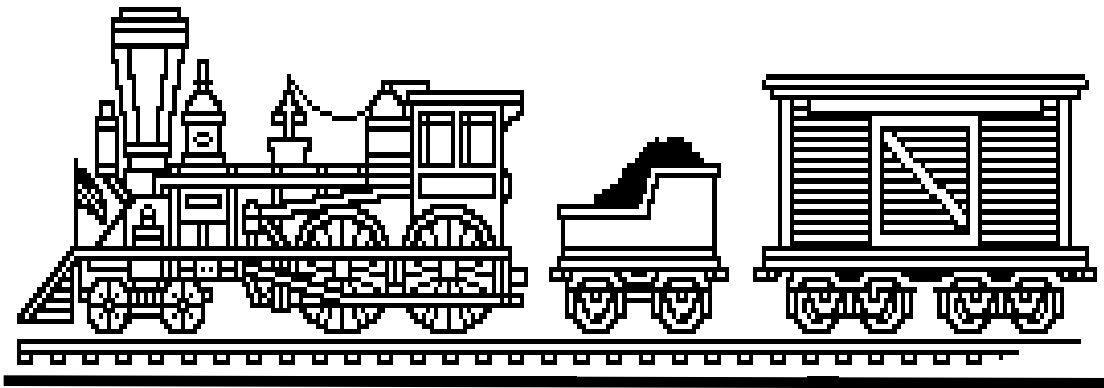
Invite a conductor, or train master to come in and speak to the class. Prior to the visit the class can generate questions to ask before the visit.

Authors:

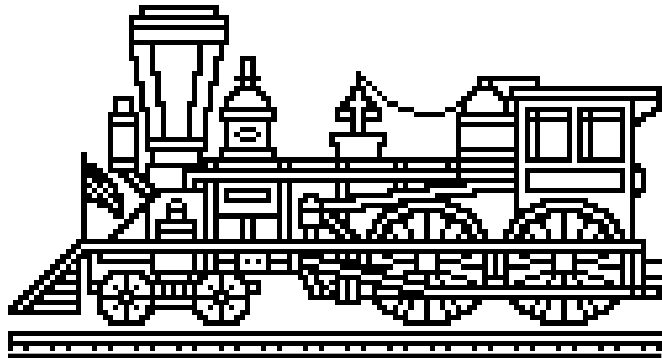
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ON THE TRACKS TO FRACTIONVILLE



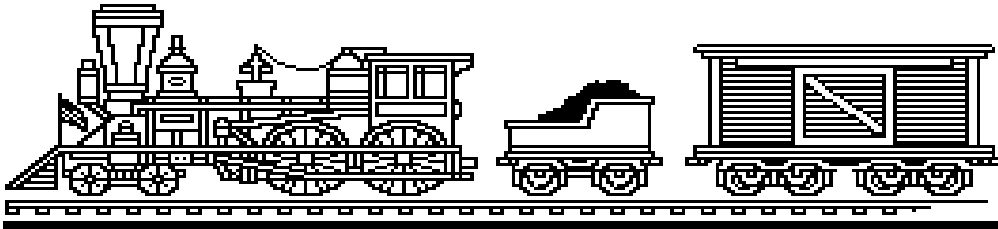
Student Resource Booklet



TransAmerican Train Festival

Mattel is having a contest to come up with a new toy train for the TransAmerica Train Festival. They are asking all the schools in our area to submit plans for the train. The winning group gets to name the train and join them at the festival to be introduced as the designers. There are specific criteria that must be followed in order to have the train entered into the festival. However, Mattel wants to keep the cost of the train below \$50.00, so they will be able to sell it for a reasonable cost to its customers after the festival.

TransAmerican Train Festival



Enter the train contest!
All school groups are eligible.
The theme for the festival this year is...

Directions: Using the clues below decode the theme for this year's festival. Write the answers from the clues on the lines next to each clue. Then write the theme on the lines above.

First 1/2 of **from** _____ First 2/9 of **triangles** _____

Last 2/5 of **three** _____ First 1/6 of **animal** _____

First 2/8 of **doughnut** _____ First 1/2 of **it** _____

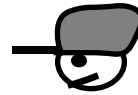
Last 1/4 of **item** _____ Last 1/10 of **invitation** _____

Trace 24 cars on the railroad track paper using the provided pattern. Your train will have a variety of cars but you will need to follow the criteria below in order to complete your train. Label each car, keeping like cars together. There will be only one label per car.

Hint: Think about which car should be first and which one should be last on the train.

Train Criteria

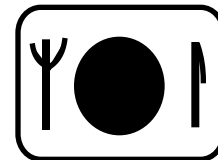
1/24 of all the cars is the engine



1/24 of all the cars is the caboose



1/8 of all the cars must be dinning cars



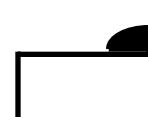
1/3 of all the cars must be passenger cars



1/4 of all the cars must be baggage cars



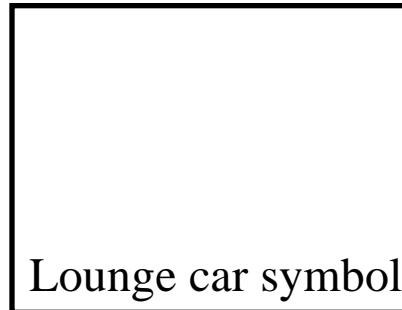
1/6 of all the cars must be sleeper cars



What fraction of the cars have not been labeled? _____

Explain how you got your answer.

Any remaining cars should be labeled as lounge cars.
Design your own symbol in the space below and then use
the new symbol to label any car(s) not already labeled on
your train.



What type of car shows up the most on your train?

Add the following features to your train. Be sure to
read each one carefully.

Train Features

1/2 of the passenger cars have 3 windows.

2/3 of the dinning cars have 1 smokestack.

4/4 of the sleeper cars have 1 window with curtains.

Compute the cost of purchasing the cars for your train. Mattel wants the total cost of your train not to exceed \$50.00. Using the price list, complete the table to compute the total cost of all the cars for your train.

Train Budget

<u>Cost of Cars</u>	
Engine	\$5.00
Caboose	\$3.00
Passenger Car	\$1.50
Dining Car	\$2.00
Baggage Car	\$1.00
Sleeper Car	\$1.25
Lounge Car	\$3.00

Type of Car	Number of Cars	Cost of Each Car	Total
Total cost of all the cars			

In order to be eligible to enter the TransAmerican Train Festival, the trains needs to be decorated according to the festival's theme. However, you must also stay within the budget Mattel has set to be considered as a participant in our school's competition. Remember the winners not only go to the festival, but their train will be chosen as the new toy train to represent Mattel on the market. Now you must compute how much money your group will have to spend on decorating the train.

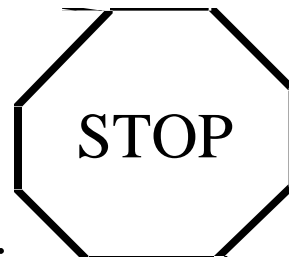
What was the total cost of cars on your train? _____

What is the total budget Mattel has set for you to spend on your train? _____

What amount do you have left to spend on decorating your train?_____

Write a number sentence to explain the amount of money your group has left to spend on decorating your train.

Wait for further directions.



Decorating Costs

Paint:

Each can of paint can cover 4 cars.

Red	\$2.00 per can
Blue	\$2.00 per can
Purple	\$2.00 per can
Yellow	\$2.00 per can
Black	\$2.00 per can
Stars	\$0.25 per car
Stripes	\$0.25 per car
Glitter	\$0.50 per sprinkle
Sequins	\$0.25 per car

The amount of money our group has to spend on decorating is_____.

In the space below create a table to organize all the items you want to purchase to decorate your train.

Now that your group has finished decorating the train,
describe your train using fractional language.

The train contest is drawing near and Mattel needs to pick a train to represent them at the TransAmerica Train Festival. In order for your group's train to be pick they need to know why you think your train is the best one. Write a letter to Mattel persuading them to choose your group's train to send to the festival.

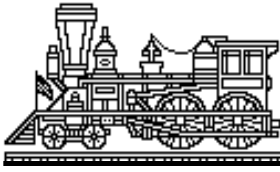
Complete the FATP form below.

F _____

A _____

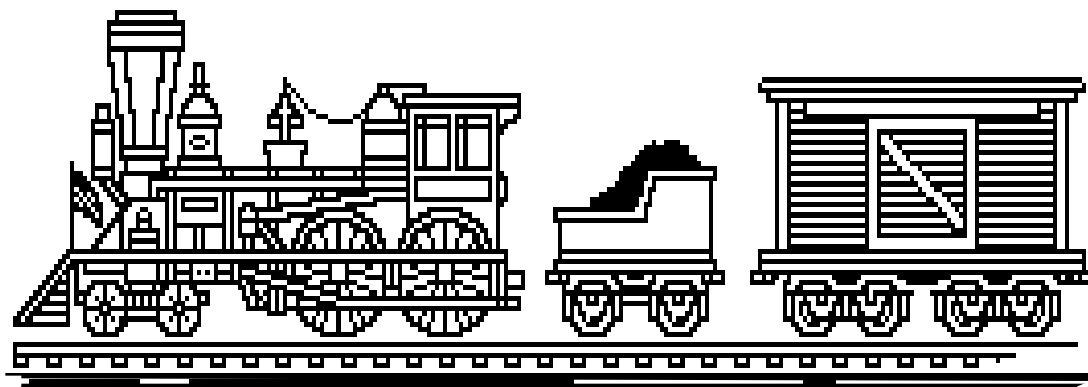
T _____

P _____



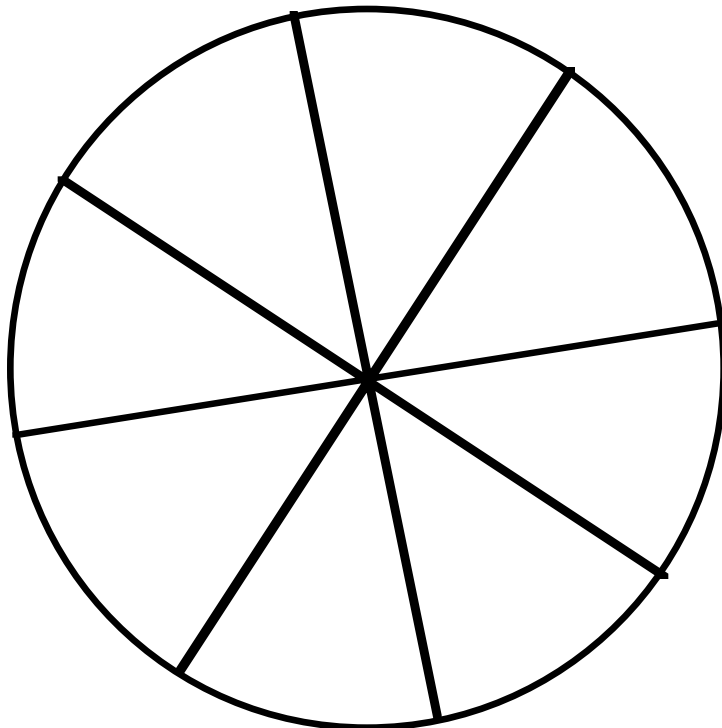
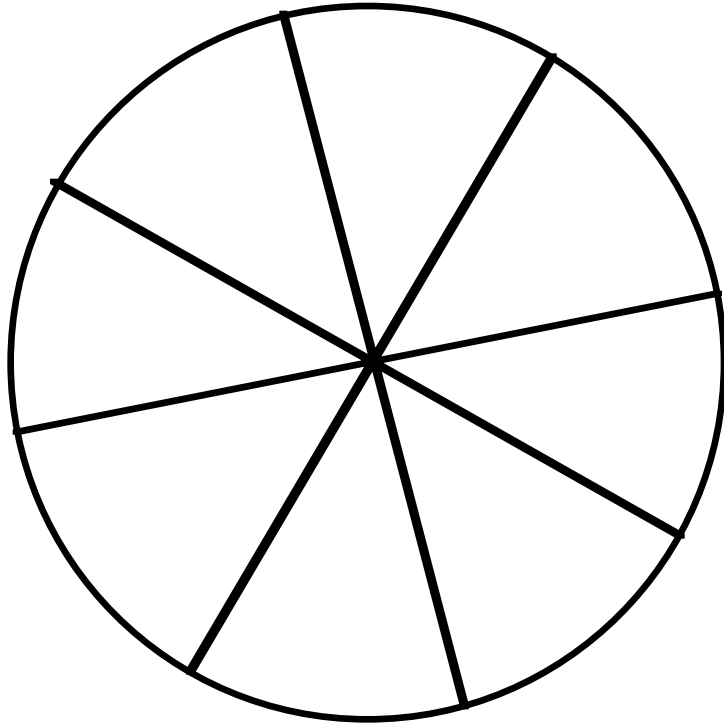
Student Resource Sheet 5.2

ON THE TRACKS TO FRACTIONVILLE

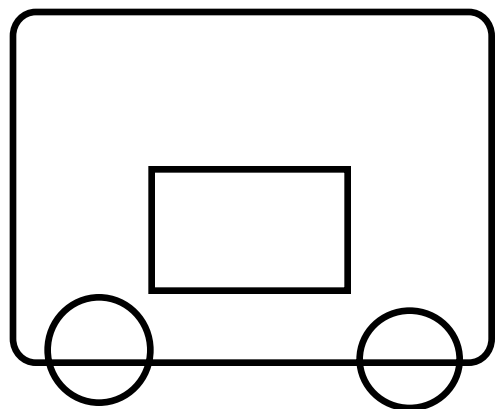
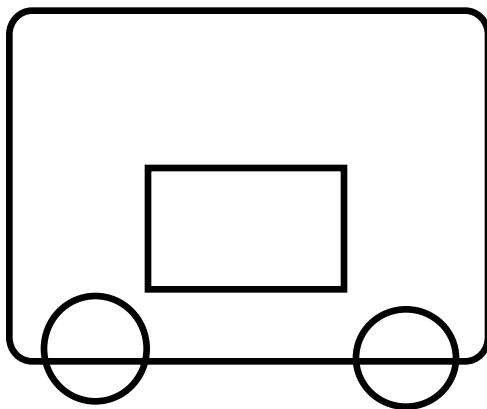
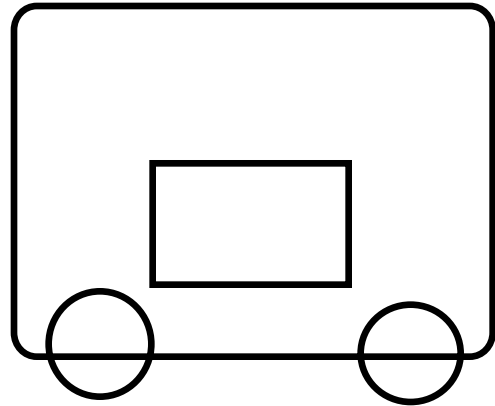
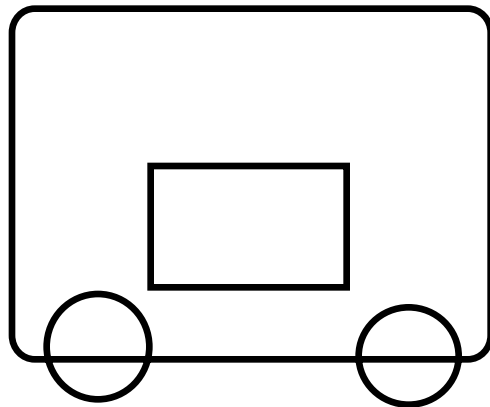


Teacher Resource Booklet

Spinners



Train Patterns



Train Criteria Answers

	Number of cars
$\frac{1}{24}$ of all the cars is the engine	1
$\frac{1}{24}$ of all the cars is the caboose	1
$\frac{1}{8}$ of all the cars must be dinning cars	3
$\frac{1}{3}$ of all the cars must be passenger cars	8
$\frac{1}{4}$ of all the cars must be baggage cars	6
$\frac{1}{6}$ of all the cars must be sleeper cars	4
What fraction of the cars have not been labeled?	$\frac{1}{24}$
Explain how you got your answer.	

Answers will vary.

Compute the cost of purchasing the cars for your train. Mattel wants the total cost of your train not to exceed \$50.00. Using the price list complete the table to compute the total cost of all the cars for your train.

Train Budget

<u>Cost of Cars</u>	
Engine	\$5.00
Caboose	\$3.00
Passenger Car	\$1.50
Dining Car	\$2.00
Baggage Car	\$1.00
Sleeper Car	\$1.25
Lounge Car	\$3.00

Note: These figures may be incorrect if the students did not follow the train criteria sheet correctly. Therefore, if the student computed the cost according to the cars on their incorrect train, then they should be given credit, if the table agrees with their train.

Type of Car	Number of Cars	Cost of Each Car	Total
Engine	1	\$5.00	\$5.00
Caboose	1	\$3.00	\$3.00
Passenger	8	\$1.50	\$12.00
Dining	3	\$2.00	\$6.00
Baggage	6	\$1.00	\$6.00
Sleeper	4	\$1.25	\$5.00
Lounge	1	\$3.00	\$3.00
Total cost of all the cars			\$40.00

In order to be eligible to enter the TransAmerican Train Festival, the trains need to be decorated according to the festival's theme. However, you must also stay within the budget Mattel has set to be considered as a participant in our school's competition. Remember the winners not only go to the festival, but their train will be chosen as the new toy train to represent Mattel on the market. Now you must compute how much money your group will have to spend on decorating the train.

What was the total cost of cars on your train? \$40.00

What is the total budget Mattel has set for you to spend on your train? \$50.00

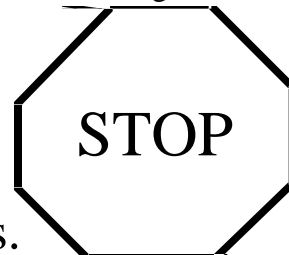
What amount do you have left to spend on decorating your train? \$10.00

Write a number sentence to explain the amount of money your group has left to spend on decorating your train.

$$\underline{\$50.00 - \$40.00 = \$10.00}$$

Note: These answers will vary if the student's train did not follow the exact criteria. Then you will need to refer back to the Student Resource Sheet 3.1 for the total cost and the amount left to spend on decorating.

If the students come up with a total cost higher than \$50.00 and they do not have any money left, you could give them an extra \$10.00 to use for decorating costs.



Wait for further directions.

Scoring Key

- 3** - Staying within the set budget.
 - Organized data in a table.
 - Accurately tells the amount and cost needed for each supply.
 - Computations are correct.
 - Neatly and clearly written.

- 2** - Staying within the set budget.
 - Organized the data.
 - The amount the each supply does not always agree with the cost.
 - A few errors in computations.
 - Neat.

- 1** - Did not stay within the budget.
 - Attempts to organize the data.
 - Many errors in computations.

- 0** - Illegible/off task/blank

Scoring Key

- 2** - Describes the train using 3-4 fractions.
 - Uses complete sentences.
 - Neat and concisely written.
- 1** - Describes the train using 2 fractions.
- 0** - Illegible/off task/blank

Scoring Rubric for Writing to Persuade Letter

- 4** - The writing is highly developed, identifies a clear position and fully supports that position.
 - Addresses the needs of the audience.
 - An organizational plan is logical and consistently maintained.
 - Consistently uses language choices to enhance the text.
 - Neatly and clearly written.

- 3** - The writing is well developed, identifies a clear position and partially supports that position.
 - Addresses the needs of the audience.
 - An organizational plan is established and generally maintained.
 - Frequently uses language choices to enhance text.
 - Neatly and clearly written.

- 2** - The writing is partially developed, identifies a position and attempts to support that position.
 - Attempts to address the needs of the audience.
 - An organizational plan is established and minimally maintained.
 - Sometimes uses language choices to enhance text.

- 1** - The writing is poorly developed, and attempts to identify a position without any support.
 - Does not address the needs of the audience.
 - An organizational plan is not established.
 - Seldom uses language choices to enhance the text.

- 0** - Illegible/off task/blank.